Deployment of AVEVA™ Predictive Analytics in energy from waste

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DEPLOYMENT OF AVEVA™ PREDICTIVE ANALYTICS IN ENERGY FROM WASTE

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Summary

1. Introduction
   - SUEZ recycling and recovery UK

2. The Process
   - How energy recovery works

3. Challenges
   - What are the challenges?
   - What are the consequences when we get it wrong?

4. Predictive Monitoring
   - Why AVEVA Predictive Analytics?
   - Predictive Analytics Trial
   - Next Steps
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Introduction
SUEZ recycling and recovery UK

ABOUT US

⇒ Part of the SUEZ GROUP
⇒ +5,000 employees
⇒ Since 1988
⇒ Manage WASTE and WATER
⇒ Generate HEAT and POWER
⇒ Manufacture ALTERNATIVE Fuels
⇒ Process RECLAIMED WOOD
⇒ RECYCLE a wide range of materials
⇒ Our VISION: To live in a world where there is NO MORE WASTE
SUEZ recycling and recovery UK

ENERGY FROM WASTE

⇒ **11** UK Energy from Waste Plants

⇒ Turn **WASTE** into local source of **RENEWABLE ENERGY**

⇒ Plant waste processing capabilities range from **55kT** to **500kT** per annum

⇒ **SUEZ TOTAL** EfW generating capacity is **233 MW**

⇒ Circa **2.5MT** of household & commercial waste processed per annum

⇒ **>1.4 MILLION MWh** electricity generated every year
ENERGY FROM WASTE

⇒ We are a **WASTE MANAGEMENT COMPANY** - not a Power Generation Company!

⇒ Electrical generation capability ranging from **4MW** to **50MW**

⇒ An average EfW site is similar in size to a traditional power station

⇒ **OPERATE & MAINTAIN**

Suffolk Energy from Waste Plant
2
The Process
How energy recovery works
3

Challenges
Challenges

- Asset Performance
- Process Deviations
- Planned Maintenance
Challenges

What happens when we get it wrong?

- Increased chances of boiler tube leaks
- Offline for >5 days
- Financial impact of redirecting waste
- Financial impact of no (or reduced) power generation
- Environmental impacts

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4
Predictive Monitoring
Predictive Monitoring

**WHY AVEVA PREDICTIVE ANALYTICS?**

- A **SINGLE** Technical Plant Engineer per plant
- Difficulty assessing plant performance
- **ONE** planned maintenance period per year

- We wanted a platform that would:
  - Allow performance of processes and assets to be assessed in **VARIABLE CONDITIONS**.
  - **EARLY IDENTIFICATION** of issues
Predictive Analytics Trial

**SET-UP**
- AVEVA software installed within the SUEZ Data Centre
- The software receives all plant data from historian.

**TRIAL**
- Software trialled over 5 months at Wilton EfW Plant
- Trial included:
  - Creation of 17 models, covering 7 assets
  - Co-monitoring of models
  - 3 day onsite training course
- Challenges
  - ‘Digital models can only be as good as the instrumentation fitted on plant. Insufficient measurements can lead to poor (or a lack of) models.
- Benefits
  - Models were relatively quick to build, circa 40 minutes.
  - Models detected multiple instrumentation issues.
  - Successful detection of a combustion air fan bearing failure
Predictive Analytics Trial – Fan Model

Typical Induced Draft Air Fan

Failed Bearing
The tags are mapped in four groups to AVEVA’s standard model templates:

- Motor Mechanical
- Motor Thermal
- Fan Mechanical
- Fan Process
MODEL TRAINING DATA

- Data extracted from plant historian system back to 2018
- A year's worth of data selected as baseline training data
- A filter (yellow shaded data left) is used to deactivate the models when the motor speed is less than 800 RPM
- Data is cleaned before it is used for training to remove any outliers.
Predictive Analytics Trial – Fan Model

**WILTON LINE 1 INDUCED DRAUGHT FAN FAILURE**

- In Dec 2020, high vibration was detected
- Failure occurred two weeks before the planned outage.
- The model was able detect the first instances of bearing deterioration in May 2019.
- Earlier detection would have prevented 5 days unplanned downtime.

**LINE 1 FAN MECHANICAL MODEL**

- Significant excursion in vibration
- First warning
- Bearing failure. Bearings changed
- 24 months
LINE 1 FAN ANALYSIS

- Highest overall contributor: 70.1%
- First OMR warning
- First indication of a change in vibration: March 2019
- Deviation becomes more persistent; warnings and alerts triggered
- Significant increase: October 2020 with vibration approaching 10mm/s leading up to bearing failure
- Bearing failed

OMR Contributions

Absolute Deviation

Actual and Predicted Values

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Predictive Monitoring – AVEVA

\[ \text{CURRENT SITUATION} \]

- Models have been created & deployed on Wilton EfW
- A team of engineers have completed a 3 day training course covering model building and monitoring

Models created for:
- Boiler flue gas path
- Boiler tube leaks
- Steam turbine - mechanical & efficiency
- Generator - mechanical, thermal & electrical
- Air cooled condenser efficiency
- Water tube condenser efficiency
- Combustion air fans - mechanical, process & thermal

\[ \text{NEXT STEPS} \]

- AVEVA to create 400 models for 10 EfW plants in 6 months
- All Site Technical Plant Engineers to be trained in building and monitoring models.
- AVEVA monitoring to be used as a basis for weekly plant performance meetings, and quarterly performance review analysis.

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